

WHAT IS CLAIMED IS:

1. A method for forming a gas cluster which comprises the steps of mixing a substance liquid at room temperature under atmospheric pressure and a pressurized gas, and causing the resultant mixture to spout as a gas from a nozzle to generate a cluster which is a lumpy group of atoms or molecules.
2. The method as claimed in claim 1, wherein said substance liquid at the room temperature under the atmospheric pressure is an oxygen-containing compound.
3. The method as claimed in claim 1, wherein said substance liquid at the room temperature under the atmospheric pressure is an organic metal compound.
4. The method as claimed in claim 1, wherein said substance liquid at the room temperature under the atmospheric pressure is $\text{Ti}(\text{i} - \text{OC}_3\text{H}_7)_4$.
5. The method as claimed in claim 1, wherein said pressurized gas is an inert gas or a reactive gas.
6. The method as claimed in claim 1, wherein said nozzle is an expansion-type nozzle.
7. The method for forming gas cluster ions, which comprises the step of ionizing the gas cluster formed by the method as claimed in claim 1.
8. The method as claimed in claim 7, wherein said ionization is accomplished by irradiating an electron beam.
9. A method for forming a thin film, which comprises the step of irradiating the cluster ions formed by the method as claimed in claim 7 onto a substrate surface, thereby forming a thin film.

10. A method as claimed in claim 9, wherein said cluster ions are accelerated by acceleration voltage.

11. A method for forming a thin film, which comprises the steps of forming a cluster which is a lumpy group of atoms or molecules of a reactive substance gaseous at room temperature, irradiating cluster ions ionized therefrom onto a substrate surface, and at the same time or alternatively, irradiating a plurality of component gases of a deposit film onto the substrate surface to cause reaction thereof, thereby depositing a thin film on the substrate surface;

wherein two or more gases to be irradiated simultaneously are fed after converting same into clusters.

12. A method for forming a thin film, which comprises the steps of forming a cluster which is an annular group of atoms or molecules of a reactive substance gaseous at room temperature, irradiating cluster ions ionized therefrom onto a substrate surface, and at the same time or alternatively, irradiating a plurality of component gases of a deposit film onto the substrate surface to cause reaction thereof, thereby depositing a thin film on the substrate surface; wherein at least one of the gaseous reactive substances to be converted into cluster is an oxygen-containing substance.

13. A method for forming a thin film as claimed in claim 11, wherein an oxide film is deposited by irradiating cluster ions of a gas containing oxygen and at least an organic metal compound gas onto the substrate surface.

14. A method for forming a thin film as claimed in claim 11, which comprises the steps of irradiating oxygen gas cluster ions onto the substrate, and at the same time, or alternately, irradiating a plurality of component gases of a deposit film onto the substrate surface to cause reaction of both, thereby depositing a thin ferroelectric film on the substrate surface.